

Familiarization and Detection of Green Monopropellants

Completed Technology Project (2014 - 2015)



Project Introduction

Ammonium dinitramide (ADN) and hydroxyl ammonium nitrate (HAN) are "green" monopropellants which will be appearing at Kennedy Space Center (KSC) for processing in the next few years. These are relatively safe replacements for hydrazine as a monopropellant; however, little is known about methods of leak detection, vapor scrubbing, air emissions, or cleanup that will be required for safe and environmentally benign operations at KSC.

ADN was developed by the Swedish Space Corporation (SSC), while HAN was developed by the Air Force Research Laboratory to be a propellant. Alliant Techsystems Inc (ATK) is predominantly evaluating ADN for future use, while Ball Aerospace was awarded a NASA Technology Demonstration Mission (TDM) to use HAN as a monopropellant to be launched from KSC/Cape Canaveral Air Force Station. Kennedy Space Center needs the technology in place prior to their arrival and needs to make recommendations as to their adoption if significant issues are found.

This is novel work that is necessary to safely support the evaluation and development of the next generation of "green" propellants. The goal of this project is to develop leak detection and related technologies for the two new "green" monopropellants. This project is in its early stage of development; information regarding this project will be updated in the near future.

Anticipated Benefits

The unique capability of the Applied Chemistry Laboratory for hypergol generation and detection, and the development/evaluation of sensors, continues to bring in customers from across the country who are interested in validating new technology for hypergol systems. The ADN sensor, HAN detector and propellant familiarization project will continue to build this unique capability for future businesses and customers as well as supporting the need for "green" propellant sensors for potential future program needs.

Marshall Space Flight Center (MSFC) is currently working with the U.S. Air Force to test green propellants in F-16's Emergency Power Unit (EPU). Familiarization and sensor detection of "green" propellants will allow KSC and NASA to be able to support future hardware using these types of fuel with increased safety and mission reliability. Data acquired during this project may lead to potential new detection methods for other materials outside NASA, including toxic industrial materials and industrial processing waste.

The Swedish Space Corporation, as well as the U.S. Air Force, are currently investigating the use of green propellants in various systems. The information gained during this project will be useful to other government agencies and commercial organizations that utilize hypergol propellants.

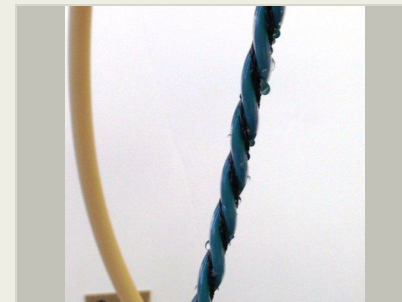


Image of a drip test using Commercial Off the Shelf (COTS) Rope Sensor to determine if and how the Rope Sensor responds to AF-M315E and LMP-103S which are 'green' mono-propellants currently in use by various Industries,...

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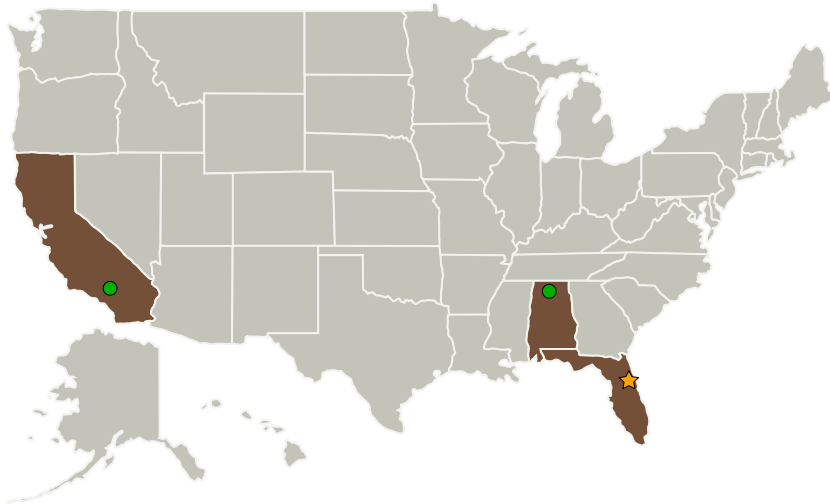
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
QinetiQ North America(QNA)	Supporting Organization	Industry	

Primary U.S. Work Locations

Alabama	California
Florida	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Center Innovation Fund: KSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Barbara L Brown

Project Manager:

Mary R Skow

Principal Investigator:

Mary R Skow

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Images

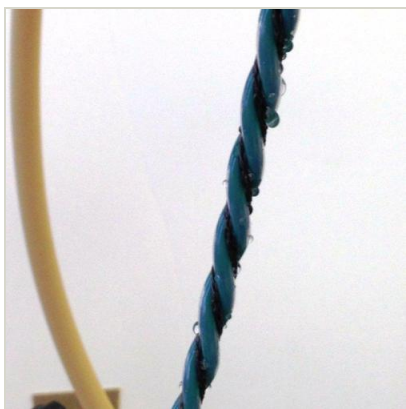
**Drip test using a rope sensor**

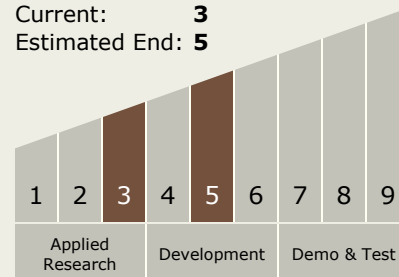
Image of a drip test using Commercial Off the Shelf (COTS) Rope Sensor to determine if and how the Rope Sensor responds to AF-M315E and LMP-103S which are 'green' mono-propellants currently in use by various Industries, Agencies and Countries.
(<https://techport.nasa.gov/image/6618>)

Links

KSC-13977
(no url provided)

Technology Maturity (TRL)

Start: 3
Current: 3
Estimated End: 5



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.2 Earth Storable